press, is little more than a reprint of the first. But the plates are a welcome addition. They represent seventy-three species, without colour, carefully drawn and easily recognisable, though sometimes badly printed. The small size of the book renders it very convenient for handy reference. A European entomologist will recognise one or two old friends, such as the Camberwell Beauty, the Painted Lady, Red Admiral, and a Small Copper, hardly distinguishable from our own; but the proportions of the various families and genera are very different from what obtains in Europe. A single plate, representing five species, and another representing only six species, are enough to illustrate the Satyridæ, and the Blues and Coppers together; while a much more crowded plate is required for the Hair-Streaks, and two for the Skippers. There are also several very large and conspicuous species, including six large Swallow-Tails, and the northern representatives of several tropical genera. But although the average size of the North American butterflies is much larger than ours, and much of the settled part of the country lies much further south, the number of species in the Northern States is much smaller than in Europe, owing to the comparative absence of Satyridæ and Lycænidæ; and it is not till we reach the frontiers of Mexico that the vast wealth of the tropical American butterfly fauna (almost equalling that of all the other continents put together) begins to dawn upon us.

W. F. K.

Elements of Qualitative Analysis. By G. H. Bailey, D.Sc., Ph.D., and G. J. Fowler, M.Sc. Pp. 115. (Manchester: J. E. Cornish, 1900.)

AMONG the distinctive characteristics of this addition to the already numerous volumes on practical chemistry are: the prominence given to the recognition of common elementary substances by an examination of their simple physical and chemical properties, the attention given to dry methods of analysis, and the series of flame-reactions. These sections provide students of practical chemistry with excellent exercises in manipulation, and will counteract the belief that the best way to analyse a substance is always to dissolve it and go through the usual routine treatment of solutions and precipitates. There is little sympathy with ordinary qualitative analysis at the present time, but where the subject is taught it should be taught intelligently; and as this little book provides a reasonable course of laboratory work, it merits a trial.

LETTERS TO THE EDITOR.

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Railways and Moving Platforms.

ABOUT twenty years ago I was in the habit of speaking with Prof. Ayrton and other friends about a scheme which might increase ten-fold the carrying capacity of the Underground Railway. I prepared a letter for the *Times* newspaper about two years ago, but at the earnest entreaty of a friend I applied for patent protection for the scheme, and did not publish the letter. I have not proceeded with the patent, and wish now that I had published the letter. Indeed, I wish that, instead of merely talking the matter over with friends twenty years ago, I had published what I had to say.

Travelling now on the new Central London Railway, one feels that there is enormous waste of energy and of time in starting and stopping the trains. Again, a train must not be longer than the platform. On my scheme the train does not stop, and the longer it is the better. Indeed, I can imagine an endless train keeping a perfectly constant speed all the time.

My scheme is easy enough to understand now that moving platforms are common. After passengers enter a station I get them gradually into a state of motion, so that moving alongside the train and at the same speed, they may enter and other passengers may leave. There are many ways in which the scheme may be carried out. From a wayside station passengers may enter an express train which does not stop, in the following way. They enter a small train at the station; this train gradually gets up a speed equal to that of the express; it runs alongside the express at a particularly well-laid part of the line; there is an exchange of passengers, and the local train gradually comes to rest again at the station.

For the Underground Railway, the method which most commended itself to Prof. Ayrton and me long ago was this. At a station, say St. James's Park, the platform was a carefully constructed turntable, 500 feet in diameter, the rim of which travelled at 8 miles per hour. The whole area was not really a floor; it was only a skeleton of a turntable, being an outer rim 8 feet broad and many radial passages. The very long train to Mansion House, travelling at 8 miles per hour, was close to the rim of the turntable; indeed geared with it in a rough, simple manner for less than half its circumference; the train from Mansion House did the same on the other side. I need not speak of the automatic opening and closing of the doors of the train.

A passenger, let us say second class for Mansion House, takes his ticket and descends a spiral staircase, which revolves so slowly that even the frailest and most timid of old ladies is not frightened; in fact, it revolves on its own axis once in 134 seconds. At the bottom the passenger sees a few notices; one of them saying second class, Mansion House, has a hand pointing along a radial passage, and this is followed. As the passenger moves radially, he does not notice that he is gradually getting up speed circumferentially. He does not notice that the floor gets slightly inclined as he moves out, to counteract the small effect of centrifugal force. When he reaches the outside of the platform he probably finds a train there, seemingly at rest, with the doors open, and he enters it, moving perhaps along the platform, choosing one compartment rather than another. If he is lucky he has about one minute in which to make his choice. But he will notice near him on the platform an altering time signal which tells him how much more time he has to waste: 50 seconds, 40, or 30, or 20, or 10; if he delays after the signal says 0, an iron railing will come between him and the train; he will see the train moving laterally away from the platform, and he must wait seventy-four seconds before he sees a train coming laterally towards him; the railing goes away, and he has again sixty seconds in which to enter.

If he had a third class ticket to South Kensington, he would have proceeded in exactly the same way. Also every passenger wanting to leave the train at St. James's Park had sixty seconds in which to do it. Trains at 16 miles an hour give only half these times. A platform of only 250 feet diameter would give only half the time if the train speed was 8 miles an hour. I need not dwell upon the details of this and other methods which suggest themselves. It may be soon or syne, but I feel sure—I have felt sure for many years—that my method will have to be adopted.

JOHN PERRY.

August 11.

Snow-drifts on Ingleborough.

IN his interesting letter on "Snow-drifts on Ingleborough in July," Prof. Hughes describes what may be called the first stage in the formation of a glacière. These ice-caves, not very rare in parts of the Alps and Jura, were made by the present Bishop of Bristol the subject of an attractive book (published thirty-five years ago), and have been occasionally noticed in the earlier volumes of NATURE and elsewhere. I have always believed that snow, drifted into caves during the winter, was the initial cause of these natural ice-houses (about half a dozen of which I have visited), and can quote a case from the Alps which is a slight variation of that described by Prof. Hughes. On July 24, 1873, I went up the Pic d'Arzinol (9845 feet) from Evolena in the Val d'Hérens, and on the way down—so far as I remember between five and six thousand feet above sea-level—my guide diverged from the track to show me what he called the Pertuis Freiss. These were two fissures, apparently joints, opened by a slight subsidence. A description of one will serve for both, except that there was hardly any descent to its floor. The fissure extended some four yards into the hill, and was at widest about as many feet. Ice was patched about the floor, and in places

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formed a plaster on the walls, its thickness being at most three inches. It showed prismatic structure, though rather small. The air within was cold (I had no thermometer); but as the surface of the ice was wet, it was above 32° F., though I think not much. The guide told me that the fissures in winter-time were filled with snow. This accumulation, probably owing to the shape of the fissure, no longer remained as snow, but was represented by the ice on the floor and walls, which the guide said seldom, if ever, disappeared. The absence of ice from the walls of the Ingleborough "swallow hole" was probably due to some exceptional dryness of the rock; but Prof. Hughes has undoubtedly found a "baby" ice-cave, like that I have described, and it will be worth examining some more of these dry shafts to see whether a slightly better developed specimen may not be lurking in the neighbourhood. T. G. BONNEY.

Permeability of Iron under the influence of the Oscillatory Discharge from a Condenser.

IN your issue of August 2 there is an abstract of a very interesting paper, read by Prof. Trowbridge, on his experiments with a battery of 20,000 secondary cells. In it he mentions that the permeability of iron when under the influence of a very powerful discharge from a large condenser is now under observation.

I should like to draw attention to some experiments I was making over a year ago in Lord Blythswood's laboratory (an account of which has not yet been published), in which I have gone into the subject in some detail.

In my experiments the lowest frequency used was about 5000 a second. I enclose two photographs of sparks taken in

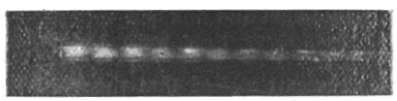

FIG. 1.

the usual way with a revolving mirror. The discharge in photograph (1) took place through a coil of about 5 millihenrys self-induction from a battery of Leyden jars of a total capacity of ·06 microfarads, the potential difference between the coatings, before discharge, being 13,500 volts. In photograph (2) a fine wire core, consisting of 550 No. 28 soft iron wires, was inserted

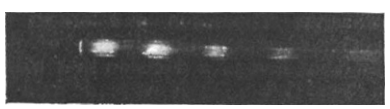

FIG. 2.

into the coil (which was wound on a hollow paper spindle of about 1·3 cm. internal diameter). The other conditions of discharge were identical in the two cases; the speed of the mirror, however, was 19 revolutions per second for photograph (1), and 16 per second for photograph (2), thus tending to draw out the spark more in the first photograph.

The essential differences are, however, well marked. At the beginning of the discharge we have the "pilot" spark, first noticed by Prof. Boys; and then in the photograph (2), taken with the iron wire cores, a series of oscillations gradually increasing in length. The first half-oscillation, however, is nearly twice as long as the half-oscillations in photograph (1), when there were no iron wire cores in the coil. The increase in the time for a half-oscillation is due, of course, to the increased self-induction of the coil on account of the iron; and the gradually-increasing length is due to the increasé in permeability of the iron as the intensity of the discharge dies away. In photograph (1) the frequency of oscillation of the spark taken with the coil having air cores is about 9000 per second, and in (2) the approximate magnitude of the current during the first discharge with the iron cores, 15 amperes.

It would be impossible in the course of a short note to describe in detail the work that has been done, but in numerous experiments (over three hundred spark photographs have been taken) that have been made, the iron has been found to behave in the same way under these oscillating magnetisations as it does when steady currents are used to produce magnetising forces of the same intensity. In most experiments single layer coils have been used in which the magnetising forces due to a given current can be calculated, and it has been possible to determine approximately the forces acting on the iron. From the results, curves showing the variation in permeability with magnetising force have been plotted. In some experiments, the magnetising current due to the discharge has been as large as 1000 amperes. In order to obtain discharges as powerful as this, a very large glass-condenser has been used with a total capacity of 1·5 microfarads, made up of plates of glass (coated with shellac) 1·6 mm. (1/16″) thick. The conducting surfaces are of tinfoil. The glass appears a great deal stronger than that used by Prof. Trowbridge, as it has been tested repeatedly at 20,000 volts. It is possible, however, that the suddenness with which his condenser is charged from his cells may account for the readiness with which the glass breaks. In my experiments the condenser was charged by a large Wimshurst machine of 160 plates, which took almost half a minute to get up the full potential of 20,000 volts. The glass used is known technically as 15 oz. 3rds selected flat sheet, and was obtained from Messrs. Malloch, of Glasgow. E. W. MARCHANT.

Blythswood Laboratory, Renfrew, August 7.

Function of the Whips of the Larva of the Puss Moth.

YOUR correspondent (p. 389) will find a detailed account of the various defensive appliances of the larva of *Cerura vinula* in Prof. Poulton's work on the "Colours of Animals" (International Science Series), and in papers published by him in the *Transactions* of the Entomological Society of London for 1886 and 1887, the latter papers being illustrated by beautiful coloured plates.

It is usually believed by entomologists that the function of the "whips" in the caudal appendages of the larva is to drive away, or frighten away, Ichneumon Flies or other enemies, but there is still room for further inquiry; and although the larva is highly protected, it is liable to the attacks of some species of Ichneumon Flies, though it may be able to defend itself against others, for the protection of no animal is absolutely complete.

The appendages are doubtless homologous with the retractile fleshy fork in the neck of the larvæ of the Swallow-tailed Butterflies (Papilionidæ), which probably fulfils a similar function. W. F. KIRBY.

Hilden, Sutton Court Road, Chiswick.

The Migration of Swifts.

ON the morning of Friday, August 10, I witnessed a large flight of Swifts travelling westward along the Sussex coast. The birds were passing this place in a continuous though thin stream for several hours; I saw them myself from 10 a.m. when I first visited the shore, and watched them till 12 noon. A few birds were also noted travelling in the same direction between 5 p.m. and 6 p.m. The day was bright but showery, and a fresh W.N.W. breeze was blowing at the time, so that the birds were flying almost against the wind; they flew low, seldom rising fifteen feet in the air, and often passing within two feet of my head as I lay on the shingle; they kept to the coast-line and for the most part over the top of the fringe of tamarisks that here stretch for miles just above the shingle. Since that day I have not seen a single Swift in the neighbourhood, in spite of having travelled on my bicycle as far west as the mouth of Chichester Harbour along the coast, and to various places north of this line as far as Chichester and Arundel inland. It would be interesting to know if other observers witnessed any similar flights on August 10, and also if Swifts are still to be seen in any places in our islands at the present time. I have on two previous occasions seen Swifts arrive on the east coast of Norfolk as late as the first week in September (after a complete dearth of the birds for some three weeks), and depart again after a few days' sojourn—these perhaps are migrants from the European continent. As many of your readers are now doubtless at the seaside, it seems a favourable opportunity to ask them to keep their eyes open and record any facts that they may observe bearing on the movements of these birds. OSWALD H. LATTER.

East Preston, near Worthing, August 19.

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